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Epidemiologic Notes and Reports

Firearm-Associated Homicides Among Family Members, Relatives, or Friends — Ohio

In 1985, 311 (56%) of 553 homicides in Ohio occurred among relatives or acquaintances; 191 (61%) of these 311 homicides involved the use of firearms (Federal Bureau of Investigation [FBI], unpublished data, 1985). To learn more about firearm homicide among persons who are closely acquainted, the Ohio Department of Health (ODH), Division of Epidemiology, interviewed offenders involved in homicides occurring between 1982 and 1985 that met the following six criteria: the homicide 1) occurred in Cleveland, Cincinnati, Columbus, Toledo, Dayton, or Akron; 2) occurred between family members, relatives, or friends; 3) was committed with a firearm kept in the household; 4) victim and offender were ≥ 18 years of age; 5) occurred in or within the immediate vicinity of a residence; and 6) was not secondary to another crime. The primary purposes of the investigation were to describe demographic characteristics of the offenders and to identify situational or environmental factors related to the homicide.

Using records from the Ohio State Department of Corrections and Rehabilitation and police records from Cleveland, Cincinnati, and Columbus, investigators identified 105 homicides that met the above criteria. Of these, interviews were completed with 50 (48%) offenders. Of the 55 offenders who were not interviewed, 37 (67%) could not be located, 12 (22%) refused to participate, and three (5%) had died. Three (5%) interviews were not completed for other reasons.

Since the Ohio homicide study included only a subset of firearm-associated homicides that occurred among family members, relatives, or friends, selected offender characteristics were compared with Ohio data from the FBI. The distribution from the Ohio homicide study approximates Ohio estimates from the FBI for median age of the offender and type of firearm used in the homicide (Table 1) (FBI, unpublished data, 1985). However, in the Ohio homicide study, offenders were less likely to be male and less likely to be white.

Offenders' responses varied widely as to their perception of the single immediate cause of the homicide. Forty percent responded that some type of threatened (30%) or actual (10%) physical abuse was occurring just before the incident, regardless of whether the victim or the offender initiated the abuse. Ten percent suggested that

Homicides — Continued

alcohol and/or drugs was the immediate reason for the incident. Other reasons for the incident included "jealousy," "money," or "the general stresses of living together" (10%), "accidental" (12%), "other" (10%), or "unknown" (18%).

Handguns were the type of firearm used in 76% of the homicides (Table 2). Less than half the offenders reported owning the firearm; only 26% reported that the weapon was purchased from a licensed dealer. Fifty-six percent of firearms were kept in the bedroom; 96% were always kept in the household in which the homicide occurred, and the remaining 4% were usually kept in the household. Self-protection was the most commonly reported (56%) purpose for obtaining the firearm.

Sixty-four percent of the firearms were always kept loaded, and at least 64% were always kept in an unlocked location. Forty-four percent were always kept loaded and in an unlocked location. Thirty-eight percent of the firearms had been owned <1 year; 66% had been owned ≤5 years.

Alcohol was reported to have been consumed before the incident by 62% of the offenders, and alcohol and/or drugs, by 88% of the offenders and/or victims. Thirty percent of the offenders had the firearm in their immediate physical possession just before the incident; 54% reported drawing a firearm or some other weapon first, and 22% reported the victim drew a firearm or some other weapon first. Thirty-eight percent believed they could not have resolved the situation without the firearm, and 22% responded that the victims "dared" them. Forty-eight percent reported they did not intend to shoot the victim when they drew the weapon. Forty percent indicated that the victim was approaching them when the gun was fired, and 48% fired the weapon within 15 seconds of brandishing it. Seventy percent of the offenders reported never practicing shooting firearms; 50% recalled that their parents had owned a firearm during their childhood. Seventy-four percent indicated that just before or during the incident they did not consider that they could go to prison for using a gun.

TABLE 1. Distribution of type of firearms used and median age, race, and sex of offenders — Ohio Homicide Study, 1982–1985, and Ohio FBI data, 1985

	Homicide study		FBI data	
Firearm homicide among:	Family, relatives, or friends (n = 50)		Family or acquaintances (n = 191)	
Median age of offender:	35 yrs		31 yrs	
Offender characteristics	No.	(%)	No.	(%)
Sex				
Male	35	(70)	158	(83)
Female	15	(30)	31	(16)
Unknown	—	—	2	(1)
Race				
White	14	(28)	95	(50)
Other	36	(72)	94	(49)
Unknown	—	—	2	(1)
Firearm				
Handgun	38	(76)	151	(79)
Long gun	12	(24)	39	(20)
Other	—	—	1	(1)

Homicides — Continued

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Editorial Note: This investigation by the ODH helps describe the problem of firearm-associated homicide in Ohio. Homicide is the fourth leading cause of years of potential life lost before age 65 in the United States and fifth in Ohio (1; ODH, unpublished data, 1987). In 1985, 59% of all U.S. homicides involved relatives and acquaintances (2). In Ohio, between 1979 and 1986, 63% of all homicides were committed with a firearm (ODH, unpublished data, 1988).

The findings in this investigation should be interpreted with caution because the sample size was limited and restricted to homicides in six urban areas and because the sample size was further reduced as a function of the number of offenders who could be included in the study. In addition, this study investigated homicides between family members, relatives, or friends, and the results may not be generalizable to other types of homicide.

However, the results from this investigation are useful in planning future investigations of possible risk factors for firearm-associated homicide among family members, relatives, or friends. In particular, several findings from this investigation suggest that the homicide was an impulsive act committed with a readily accessible firearm: in the majority of homicides, the offender and/or victim had consumed alcohol and/or drugs before the incident; approximately half the offenders fired the weapon within 15 seconds of brandishing it; approximately half the offenders did not intend to shoot the victims when they drew the weapon; and a substantial proportion

TABLE 2. Type, owner, usual storage location, purpose, and source of firearms used in 50 homicides between family, relatives, or friends — Ohio, 1982–1985

Category	No.	(%)	Category	No.	(%)
Type			Purpose		
Handgun	38	(76)	Self-protection	28	(56)
Shotgun	8	(16)	Hunting	2	(4)
Rifle	4	(8)	Target shooting	2	(4)
			Collecting	2	(4)
Owner			Other	10	(20)
Offender	22	(44)	Unknown	6	(12)
Spouse/lover	9	(18)			
Friend	8	(16)	Source		
Parent/relative	7	(14)	Licensed dealer	13	(26)
Unknown	4	(8)	Gift	2	(4)
			Stolen	1	(2)
Storage location			Illegal dealer	1	(2)
Bedroom	28	(56)	Relative (bought)	8	(16)
Kitchen	4	(8)	Stranger (bought)	7	(14)
Living room	3	(6)	Other	6	(12)
Other room	9	(18)	Unknown	12	(24)
Unknown room	4	(8)			
Other	2	(4)			

Homicides — Continued

of firearms used in these homicides were kept loaded and in an unlocked location. If confirmed by future research, these findings may represent possible avenues for intervention to prevent firearm-associated injuries.

Four areas of study have been identified for further efforts in developing effective strategies to prevent firearm-associated injuries (3): 1) collection of information on the magnitude, characteristics, and costs of the morbidity and disability caused by firearms and on the types of firearms that inflict these injuries; 2) determination of the number, type, and distribution of firearms in the United States; 3) conduct of epidemiologic studies that quantify the individual risks of injury associated with the possession of firearms; and 4) evaluation of interventions related to firearms. Pursuit of such research strategies should improve the scientific base of information needed for further research and prevention efforts.

References

1. US Department of Health and Human Services. Report of the Secretary's Task Force on Black and Minority Health: executive summary. Washington, DC: US Department of Health and Human Services, Public Health Service, 1985.
2. Federal Bureau of Investigation. Uniform crime reports for the United States, 1985. Washington, DC: US Department of Justice, Federal Bureau of Investigation, 1986.
3. Mercy JA, Houk VN. Firearm injuries: a call for science [Editorial]. *N Engl J Med* 1988; 319:1283-5.

***Mycobacterium tuberculosis* Transmission in a Health Clinic — Florida, 1988**

Between January 1 and July 1, 1988, 30 (42%) of 72 staff members tested at a western Palm Beach County, Florida, clinic were identified as having positive (≥ 10 -mm induration) tuberculin skin test (Mantoux) reactions. Seventeen (57%) of these 30 employees had a documented skin test conversion (reaction from < 10 mm to ≥ 10 mm with an increase of ≥ 6 -mm induration) within the past 18 months. The other 13 had no previous documented tuberculin skin tests. These findings indicated probable transmission of tuberculous infection in the clinic and prompted an environmental and epidemiologic investigation.

The clinic, which provides primary care, is located in a two-storied building constructed in 1984. All patient-care activities occur on the first floor. The second floor contains the administrative offices and a conference room. Ventilation studies conducted as part of the epidemiologic investigation revealed that $> 90\%$ of the air in the building was recirculated, and 0.48 fresh air exchanges occurred per hour. Only large-particle air filters were used in the air-handling units; these filters were changed once per month. In the examination rooms, air supply exceeded exhaust volumes, causing air to move from the rooms into the hallways and be recirculated throughout the building.

Based on preliminary findings, four possible sources of *Mycobacterium tuberculosis* infection were considered. 1) In June 1987, a clinic nurse was diagnosed with noncavitary pulmonary tuberculosis (TB). Although her sputum cultures were positive for *M. tuberculosis*, sputum smears were negative for acid-fast bacilli (AFB) (smear-negative patients are much less infectious than smear-positive patients [1]). 2) From January to July 1988, 39 patients with pulmonary TB were treated at the clinic; 14 of these had at least one positive sputum smear during that interval. 3) In late November 1987, the clinic began sputum inductions using an ultrasonic nebulizer

M. tuberculosis — Continued

to obtain diagnostic specimens from persons diagnosed with or suspected to have TB. On 14 different occasions between January 13 and May 18, 1988, 13 patients had induced sputum specimens that were culture-positive for *M. tuberculosis*. On nine of these 14 occasions, the patient was also smear-positive. 4) Aerosolized pentamidine treatments were initiated on January 29, 1988, for acquired immunodeficiency syndrome (AIDS) patients to prevent *Pneumocystis carinii* pneumonia (PCP). Between January 29 and June 17, 1988, six AIDS patients received a total of 31 such treatments. Two of these patients had positive sputum cultures for *M. tuberculosis* between January 29 and March 18, during a period when they received a total of 10 treatments with aerosolized pentamidine. One of these two patients, who received eight treatments, coughed profusely both during and after the therapy. This patient was also repeatedly sputum-smear-positive, even though he was reportedly taking several anti-TB medications.

To determine which of these four possible sources was most likely associated with *M. tuberculosis* infection among the staff, the Florida Department of Health and Rehabilitative Services conducted a case-control study with 16 cases and 34 controls in July 1988. A case was defined as a clinic staffer who had worked at the clinic at least 6 months and who had had a documented skin test conversion within the previous 18 months. A control was a clinic staffer who had worked there at least 6 months and who had had a negative skin test in the month before the investigation.

Cases were significantly more likely than controls to have worked at least 40 hours per week in the clinic, been present in the room when aerosolized pentamidine treatments were given, worked on the first floor, and been nonwhite (Table 1).

TABLE 1. Comparison of cases with controls* among clinic employees — western Palm Beach County, Florida, 1988

Risk factor	Cases (%) (N=16)	Controls (%) (N=34)	Odds ratio	95% confidence interval
Work ≥40 hrs/week in clinic	16 (100.0)	21 (61.8)	Infinity	1.9–infinity
In room during aerosolized pentamidine therapy	5 (31.2)	1 (2.9)	15.0	1.4–730.0
Work on first floor	15 (93.7)	21 (61.8)	9.3	1.1–420.0
Nonwhite race	14 (87.5)	16 (47.0)	7.9	1.4–78.8
Patient contact	15 (93.7)	25 (73.5)	5.4	0.6–252.0
Physician	3 (18.8)	2 (5.9)	3.7	0.4–47.6
Lunch eaten in staff lounge	6 (37.5)	6 (17.6)	2.8	0.6–13.1
Contact [†] with nurse with TB	4 (25.0)	4 (11.8)	2.5	0.4–15.5
Resident of western Palm Beach County	12 (75.0)	22 (64.7)	1.6	0.4–8.4
In room during sputum inductions	2 (12.5)	3 (8.8)	1.5	0.1–14.3
Female sex	13 (81.2)	26 (76.5)	1.3	0.3–9.1
Cigarette smoker [‡]	1 (6.2)	5 (14.7)	0.4	0.0–4.0

*Case = clinic staffer who had worked at the clinic at least 6 months and who had had a documented skin test conversion within the previous 18 months. Control = clinic staffer who had worked there at least 6 months and who had had a negative skin test in the month before the investigation.

[†]Having worked face-to-face at least once per week with the nurse diagnosed with TB.

[‡]Greater than one half pack per day for the past 5 years.

M. tuberculosis — Continued

Transmission caused by face-to-face exposure to TB patients not receiving aerosolized pentamidine could not be excluded. Many staff members were unaware which patients had TB.

Aerosolized pentamidine treatments and sputum inductions were stopped in June 1988 pending construction of appropriate exhaust systems for rooms in which these procedures are performed and changes in the building's ventilation system. All clinic staff with negative tuberculin reactions were retested in September; no new skin test conversions occurred. Isoniazid prophylaxis was provided to all converters.

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TABLE I. Summary — cases of specified notifiable diseases, United States

Disease	15th Week Ending			Cumulative, 15th Week Ending		
	April 15, 1989	April 16, 1988	Median 1984-1988	April 15, 1989	April 16, 1988	Median 1984-1988
Acquired Immunodeficiency Syndrome (AIDS)	357	U*	372	9,368	8,785	3,591
Aseptic meningitis	70	74	74	1,113	1,165	1,174
Encephalitis: Primary (arthropod-borne & unspc)	9	13	17	171	198	238
Post-infectious	-	6	3	21	26	26
Gonorrhea: Civilian	8,682	11,158	14,395	184,799	192,556	232,596
Military	144	208	313	3,119	3,582	5,001
Hepatitis: Type A	602	551	410	9,512	7,286	6,526
Type B	371	461	499	5,780	6,005	7,034
Non A, Non B	49	57	63	638	748	962
Unspecified	16	40	96	718	607	1,319
Legionellosis	11	13	9	244	243	183
Leprosy	4	-	3	40	50	63
Malaria	16	20	13	280	195	195
Measles: Total†	183	131	111	2,560	672	754
Indigenous	150	86	96	2,389	577	680
Imported	33	45	4	171	95	95
Meningococcal infections	31	80	67	1,010	1,083	1,041
Mumps	90	138	138	1,558	1,607	1,206
Pertussis	23	61	44	488	689	533
Rubella (German measles)	7	3	11	80	62	115
Syphilis (Primary & Secondary): Civilian	497	624	485	11,451	10,594	8,152
Military	4	2	5	85	60	62
Toxic Shock syndrome	6	7	8	95	94	96
Tuberculosis	298	439	418	5,203	5,220	5,427
Tularemia	-	1	1	13	26	25
Typhoid Fever	5	9	8	108	100	78
Typhus feve., tick-borne (RMSF)	2	1	3	24	19	19
Rabies, animal	91	89	130	1,163	1,069	1,341

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1989		Cum. 1989
Anthrax	-	Leptospirosis	35
Botulism: Foodborne	6	Plague	-
Infant	3	Polioomyelitis, Paralytic	-
Other	3	Psittacosis (Fls. 1, Mich. 1, Nebr. 1, Pa. 1, Calif. 1)	30
Brucellosis (Mich. 1)	7	Rabies, human	-
Cholera	-	Tetanus (La. 1)	13
Congenital rubella syndrome	1	Trichinosis (Upstate N.Y. 1)	8
Congenital syphilis, eggs <1 year	-		
Diphtheria	-		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.

†Thirty-two of the 183 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending April 15, 1989 and April 16, 1988 (15th Week)

Reporting Area	AIDS	Aseptic Mening- itis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel- losis	Leprosy
			Primary	Post-in- fectious			A	B	NA,NB	Unspeci- fied		
	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1988
UNITED STATES	9,368	1,113	171	21	184,799	192,556	9,512	5,780	638	718	244	40
NEW ENGLAND	451	45	4	1	5,292	5,846	204	318	29	27	18	3
Maine	24	2	1	-	86	137	4	14	3	1	3	-
N.H.	9	1	-	-	58	93	27	20	5	2	-	-
Vt.	3	-	-	-	20	46	9	23	3	-	-	-
Mass.	262	20	1	1	2,028	2,097	75	202	12	20	12	3
R.I.	22	14	-	-	450	505	5	28	2	2	3	-
Conn.	131	8	2	-	2,640	2,988	94	31	4	2	-	-
MID. ATLANTIC	2,617	167	33	2	27,446	30,159	1,331	928	65	83	65	2
Upstate N.Y.	380	69	9	1	4,673	5,685	327	217	24	3	20	1
N.Y. City	1,186	25	1	1	12,137	13,750	107	299	13	66	7	-
N.J.	708	-	23	-	4,153	4,319	125	156	9	5	7	-
Pa.	343	73	-	-	6,483	8,405	772	256	19	9	31	1
E.N. CENTRAL	803	153	55	-	31,465	30,611	478	653	51	20	66	-
Ohio	126	42	15	-	8,331	7,144	117	172	8	2	40	-
Ind.	168	45	18	-	2,185	2,418	27	113	8	4	12	-
Ill.	326	4	2	-	9,198	8,601	177	67	3	7	-	-
Mich.	152	53	15	-	9,449	9,874	110	210	20	7	10	-
Wis.	31	9	5	-	2,302	2,574	47	91	12	-	4	-
W.N. CENTRAL	202	42	4	1	8,115	7,655	288	211	19	3	6	1
Minn.	46	5	-	-	819	1,064	24	36	2	2	2	-
Iowa	24	8	2	-	641	527	21	14	4	-	2	-
Mo.	107	14	-	-	4,916	4,380	167	135	8	1	-	-
N. Dak.	2	3	-	-	38	57	3	8	2	-	-	-
S. Dak.	3	2	1	-	79	162	2	3	3	-	-	-
Nebr.	9	3	1	-	502	471	44	10	-	-	2	1
Kans.	11	7	-	-	1,120	1,024	27	5	-	-	-	-
S. ATLANTIC	1,808	252	21	4	52,377	53,386	761	1,190	93	107	31	-
Del.	34	8	1	-	856	768	17	46	-	1	3	-
Md.	238	27	3	-	5,828	5,696	174	214	13	12	10	-
D.C.	157	5	-	-	3,105	3,474	2	5	1	-	-	-
Va.	156	50	10	-	4,408	3,853	55	80	14	58	1	-
W. Va.	12	2	3	-	407	480	7	25	2	1	-	-
N.C.	155	34	-	1	7,712	8,082	154	323	35	-	8	-
S.C.	85	8	-	-	4,779	3,857	12	142	3	4	2	-
Ga.	297	21	1	-	10,145	10,293	115	121	7	4	2	-
Fla.	674	97	3	3	15,137	16,863	225	234	18	27	5	-
E.S. CENTRAL	217	115	12	1	15,641	14,681	85	409	51	1	5	-
Ky.	41	31	3	1	1,422	1,224	37	114	18	-	1	-
Tenn.	45	14	-	-	5,197	4,845	18	218	12	-	3	-
Ala.	68	58	9	-	5,037	5,098	23	71	20	1	1	-
Miss.	63	12	-	-	3,985	3,524	7	6	1	-	-	-
W.S. CENTRAL	955	71	17	1	20,332	21,956	1,098	512	41	170	16	9
Ark.	24	3	-	-	1,966	1,973	66	22	2	2	1	-
La.	136	7	1	-	4,202	4,687	73	75	4	1	4	-
Okl.	35	12	6	-	1,851	1,979	124	53	8	8	8	-
Tex.	780	49	10	1	12,313	13,317	635	362	27	159	3	9
MOUNTAIN	294	39	4	1	3,641	4,104	1,448	367	74	63	15	1
Mont.	1	-	-	-	55	119	13	14	1	-	2	1
Idaho	7	-	-	-	68	116	63	26	5	2	-	-
Wyo.	6	-	-	-	37	68	7	1	-	-	-	-
Colo.	111	12	1	1	653	994	205	63	25	32	2	-
N. Mex.	23	4	-	-	404	396	171	64	16	1	-	-
Ariz.	61	18	2	-	1,443	1,385	783	125	13	24	7	-
Utah	16	4	1	-	141	195	85	23	9	3	3	-
Nev.	69	1	-	-	840	831	121	51	5	1	1	-
PACIFIC	2,021	229	21	10	20,500	24,178	3,819	1,192	215	244	22	24
Wash.	197	-	-	-	1,791	2,048	771	196	51	11	2	1
Oreg.	71	-	-	-	818	872	644	112	28	7	1	-
Calif.	1,724	212	19	10	17,476	20,700	2,028	867	131	222	18	19
Alaska	4	-	2	-	275	321	335	14	5	2	1	-
Hawaii	25	17	-	-	140	237	41	1	-	2	-	4
Guam	-	-	-	-	-	45	-	-	-	-	-	-
P.R.	496	33	1	-	268	442	30	71	5	7	-	4
V.I.	15	-	-	-	170	110	-	4	-	-	-	-
Amer. Samoa	-	-	-	-	-	17	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	-	15	-	-	-	-	-	-

N: Not notifiable

U: Unavailable

C.N.M.I.: Commonwealth of the Northern Mariana Islands

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 15, 1989 and April 16, 1988 (15th Week)

Reporting Area	Malaria	Measles (Rubella)					Menin- gococcal infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total		1989	Cum. 1989	1989	Cum. 1989	Cum. 1989	1989	Cum. 1989	Cum. 1989
		1989	Cum. 1989	1989	Cum. 1989										
UNITED STATES	280	150	2,369	33	171	672	1,010	90	1,558	23	488	689	7	80	62
NEW ENGLAND	16	-	22	-	5	45	77	-	12	1	15	74	-	-	-
Maine	-	-	-	-	-	-	8	-	-	-	4	11	-	-	-
N.H.	1	-	1	-	-	43	9	-	9	-	5	21	-	-	-
Vt.	-	-	1	-	-	-	5	-	-	1	2	1	-	-	-
Mass.	11	-	-	-	3	1	37	-	2	-	-	33	-	-	-
R.I.	3	-	18	-	2	-	1	-	-	-	2	1	-	-	-
Conn.	1	-	2	-	-	1	17	-	1	-	2	7	-	-	-
MID. ATLANTIC	44	4	84	32	81	156	125	5	53	-	37	20	-	2	4
Upstate N.Y.	8	1	5	32†	68	2	41	2	17	-	18	7	-	1	1
N.Y. City	15	3	20	-	13	18	19	3	3	-	1	1	-	1	1
N.J.	8	-	50	-	-	-	29	-	11	-	14	2	-	-	-
Pa.	13	-	9	-	-	136	36	-	22	-	4	10	-	-	1
E.N. CENTRAL	14	71	282	-	38	45	102	8	143	1	26	80	2	6	20
Ohio	6	71	183	-	35	3	95	-	8	-	1	16	2	2	-
Ind.	2	-	-	-	-	-	12	1	15	-	10	38	-	-	-
Ill.	3	U	99	U	-	30	9	U	51	U	-	3	U	3	10
Mich.	1	-	-	-	1	12	19	6	56	1	8	13	-	-	4
Wis.	2	-	-	-	2	-	7	1	13	-	7	10	-	1	-
W.N. CENTRAL	5	-	153	-	1	-	25	-	233	-	14	33	-	1	-
Minn.	4	-	-	-	-	-	6	-	-	-	-	4	-	-	-
Iowa	-	-	-	-	-	-	-	-	10	-	6	14	-	-	-
Mo.	1	-	132	-	-	-	5	-	34	-	6	5	-	1	-
N. Dak.	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
S. Dak.	-	-	-	-	-	-	4	-	-	-	1	2	-	-	-
Nebr.	-	-	-	-	-	-	9	-	2	-	-	-	-	-	-
Kans.	-	-	21	-	1	-	1	-	187	-	1	2	-	-	-
S. ATLANTIC	54	29	136	-	10	180	172	16	250	1	44	61	1	2	1
Dal.	1	-	-	-	-	-	1	-	-	-	-	3	-	-	-
Md.	13	-	5	-	5	2	28	14	141	-	4	10	-	1	-
D.C.	3	U	-	U	2	-	7	U	45	U	-	U	-	-	-
Va.	8	-	-	-	-	54	21	-	33	-	3	9	-	-	-
W. Va.	1	-	-	-	-	6	7	1	7	1	10	-	-	-	-
N.C.	9	19	118	-	-	1	25	-	7	-	13	21	-	-	-
S.C.	1	-	-	-	-	-	13	-	7	-	-	-	-	-	-
Ge.	3	-	-	-	-	-	29	-	1	-	4	13	-	-	-
Fla.	15	10	13	-	3	87	41	1	9	-	10	5	1	1	1
E.S. CENTRAL	3	1	3	-	-	6	31	1	65	1	23	8	1	1	-
Ky.	-	-	1	-	-	-	13	-	9	-	-	-	-	-	-
Tenn.	-	1	1	-	-	-	2	1	19	1	8	6	1	1	-
Ala.	2	-	1	-	-	-	8	-	5	-	15	-	-	-	-
Miss.	1	-	-	-	-	6	2	N	N	-	-	2	-	-	-
W.S. CENTRAL	16	46	1,397	-	19	9	76	44	587	2	18	29	1	9	3
Ark.	-	-	-	-	-	-	3	9	64	2	6	5	-	-	2
La.	1	-	4	-	-	-	16	20	187	-	4	2	-	3	-
Ola.	1	-	23	-	-	8	6	4	126	-	8	22	1	1	1
Tex.	13	45	1,370	-	19	1	51	11	210	-	-	-	-	5	-
MOUNTAIN	11	-	13	1	10	109	28	7	65	14	239	265	-	2	2
Mont.	-	-	12	-	1	-	1	1	2	-	-	1	-	1	-
Idaho	2	-	-	-	1	-	-	-	5	3	24	215	-	-	-
Wyo.	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Colo.	1	-	-	-	-	109	10	-	5	-	17	6	-	-	1
N. Mex.	1	-	-	1‡	7	-	1	N	N	-	4	2	-	-	-
Ariz.	3	-	1	-	-	-	15	6	46	10	188	18	-	-	-
Utah	-	-	-	-	-	-	1	-	3	1	5	21	-	-	-
Nev.	3	-	-	-	-	-	-	-	4	-	1	1	-	1	1
PACIFIC	118	-	298	-	7	152	374	9	150	3	72	119	2	57	32
Wash.	3	-	-	-	1	-	33	-	11	2	15	25	-	-	-
Oreg.	6	-	-	-	-	1	29	N	N	-	2	1	-	-	-
Calif.	107	-	298	-	3	149	309	9	133	1	53	70	2	43	29
Alaska	2	-	-	-	-	-	2	-	-	-	-	3	-	-	-
Hawaii	-	-	1	-	3	2	1	-	6	-	2	20	-	14	3
Guam	-	U	-	U	-	1	-	U	-	U	-	U	-	-	1
P.R.	-	44	218	-	-	109	2	-	1	-	2	3	-	3	-
V.I.	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-
Amer. Samoa	-	U	-	U	-	-	-	U	-	U	-	U	-	-	-
C.N.M.I.	-	U	-	U	-	-	-	U	-	U	-	U	-	-	-

*For measles only, imported cases includes both out-of-state and international importations.

N: Not notifiable U: Unavailable †International ‡Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 15, 1989 and April 16, 1988 (15th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic- shock Syndrome	Tuberculosis		Tula- remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989
UNITED STATES	11,451	10,594	95	5,203	5,220	13	108	24	1,183
NEW ENGLAND	451	305	2	111	97	-	10	-	1
Maine	3	5	2	3	3	-	-	-	-
N.H.	1	2	-	4	-	-	-	-	-
Vt.	-	-	-	1	-	-	-	-	-
Mass.	147	125	-	56	51	-	5	-	-
R.I.	11	11	-	18	8	-	4	-	-
Conn.	269	182	-	29	25	-	1	-	1
MID. ATLANTIC	2,388	2,128	16	1,100	1,004	1	31	3	156
Upstate N.Y.	218	135	1	77	166	-	2	1	2
N.Y. City	1,207	1,398	2	667	472	-	20	-	-
N.J.	386	237	5	169	175	-	7	-	-
Pa.	557	358	8	187	191	1	2	2	154
E.N. CENTRAL	425	324	16	589	621	1	9	2	19
Ohio	30	29	7	101	113	-	2	1	-
Ind.	17	18	4	46	71	-	1	1	2
Ill.	185	170	-	253	244	-	2	-	2
Mich.	176	97	5	165	155	-	3	-	3
Wis.	17	10	-	24	38	1	1	-	12
W.N. CENTRAL	100	63	20	142	152	3	4	1	115
Minn.	6	6	5	29	25	-	1	-	30
Iowa	13	8	3	26	13	-	2	1	6
Mo.	45	35	3	53	73	3	1	-	9
N. Dak.	1	1	-	3	4	-	-	-	7
S. Dak.	-	-	3	7	15	-	-	-	32
Nebr.	15	7	5	6	4	-	-	-	13
Kans.	20	6	1	18	18	-	-	-	-
S. ATLANTIC	4,215	3,758	9	1,089	1,144	1	7	13	378
Del.	52	47	-	7	13	-	-	-	10
Md.	228	204	-	91	100	-	-	1	90
D.C.	246	175	-	45	49	-	2	-	2
Va.	164	128	1	104	127	1	1	-	78
W. Va.	4	1	-	26	30	-	-	-	23
N.C.	244	238	4	95	71	-	2	11	-
S.C.	217	176	1	109	118	-	-	1	64
Ga.	910	605	2	151	186	-	-	-	56
Fla.	2,150	2,186	1	461	450	-	1	-	55
E.S. CENTRAL	726	541	1	448	418	1	1	2	116
Ky.	18	18	-	120	119	1	1	2	58
Tenn.	264	198	-	96	100	-	-	-	30
Ala.	274	165	1	144	128	-	-	-	28
Miss.	170	180	-	88	71	-	-	-	-
W.S. CENTRAL	1,494	1,131	5	600	612	3	6	1	205
Ark.	103	55	-	77	59	1	-	-	25
La.	338	209	-	61	92	-	1	-	-
Okla.	24	48	3	54	58	2	-	1	27
Tex.	1,029	819	2	408	403	-	5	-	153
MOUNTAIN	212	194	7	137	126	1	1	1	44
Mont.	-	2	-	4	-	-	-	-	26
Idaho	-	-	1	3	-	-	-	-	-
Wyo.	1	-	-	-	-	-	-	-	6
Colo.	36	28	-	2	20	1	-	1	-
N. Mex.	7	17	1	27	33	-	-	-	9
Ariz.	62	53	4	66	58	-	1	-	2
Utah	8	7	-	17	-	-	-	-	-
Nev.	98	87	1	18	15	-	-	-	1
PACIFIC	1,480	2,150	19	987	1,046	2	39	1	129
Wash.	52	70	1	53	59	-	-	-	-
Oreg.	91	81	-	33	35	-	-	1	-
Calif.	1,309	1,984	17	839	892	2	38	-	70
Alaska	3	4	-	12	11	-	-	-	50
Hawaii	5	11	1	50	49	-	1	-	-
Guam	-	-	-	-	7	-	-	-	-
P.R.	147	180	-	60	54	-	-	-	13
V.I.	1	1	-	2	3	-	-	-	-
Amer. Samoa	-	-	-	-	3	-	-	-	-
C.N.M.I.	-	1	-	-	8	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending
April 15, 1989 (15th Week)

Reporting Area	All Causes, By Age (Years)						P&I**	Total	Reporting Area	All Causes, By Age (Years)						P&I**	Total
	All Ages	≥65	45-64	25-44	1-24	<1				All Ages	≥65	45-64	25-44	1-24	<1		
NEW ENGLAND	872	509	93	39	11	20	44		S. ATLANTIC	1,337	810	275	144	43	65	66	
Boston, Mass.	186	137	23	14	4	8	17		Atlanta, Ga.	185	108	39	23	2	13	3	
Bridgeport, Conn.	31	19	6	3	2	1	3		Baltimore, Md.	209	123	51	21	10	4	10	
Cambridge, Mass.	23	19	2	1	-	1	3		Charlotte, N.C.	96	59	23	10	1	5	8	
Fall River, Mass.	30	31	7	1	-	-	6		Jacksonville, Fla.	136	87	27	11	5	6	10	
Hartford, Conn.	71	51	13	3	1	3	6		Miami, Fla.	144	71	38	21	6	8	1	
Lowell, Mass.	27	21	4	2	-	-	1		Norfolk, Va.	52	42	5	4	-	1	1	
Lynn, Mass.	14	11	3	-	-	-	-		Richmond, Va.	77	55	12	5	4	1	9	
New Bedford, Mass.	24	20	1	1	1	1	1		Savannah, Ga.	48	34	7	4	-	3	3	
New Haven, Conn.	38	26	6	2	1	3	6		St. Petersburg, Fla.	87	67	10	3	1	6	4	
Providence, R.I.	51	42	6	1	2	-	4		Tampa, Fla.	82	46	20	10	3	3	6	
Somerville, Mass.	6	6	-	-	-	-	-		Washington, D.C.	193	97	43	28	10	15	11	
Springfield, Mass.	43	33	5	4	-	1	2		Wilmington, Del.	26	21	-	4	1	-	-	
Waterbury, Conn.	41	27	9	5	-	-	2		E.S. CENTRAL	789	526	167	47	27	22	59	
Worcester, Mass.	76	66	8	2	-	2	-		Birmingham, Ala.	114	72	27	10	2	3	6	
MID. ATLANTIC	3,101	2,049	595	299	79	79	159		Chattanooga, Tenn.	77	60	11	2	1	3	9	
Albany, N.Y.	60	46	9	3	1	1	6		Knoxville, Tenn.	72	51	14	5	2	-	5	
Allentown, Pa.	60	46	9	3	1	1	6		Louisville, Ky.	107	72	23	5	3	7	7	
Buffalo, N.Y.	125	95	19	5	3	3	7		Memphis, Tenn.	190	117	47	10	11	5	25	
Camden, N.J.	46	28	11	3	1	3	-		Mobile, Ala.	63	42	12	6	2	1	2	
Elizabeth, N.J.	21	13	6	2	-	-	1		Montgomery, Ala.	44	33	9	2	-	-	1	
Erie, Pa.	37	28	5	4	-	-	2		Nashville, Tenn.	122	79	24	7	5	7	4	
Jersey City, N.J.	59	41	7	7	2	2	2		W.S. CENTRAL	1,801	1,152	385	184	59	41	73	
N.Y. City, N.Y.	1,470	897	296	189	45	43	65		Austin, Tex.	64	43	10	8	2	1	5	
Newark, N.J.	44	21	10	7	5	1	6		Baton Rouge, La.	48	38	4	2	1	2	1	
Patterson, N.J.	19	10	5	4	-	-	6		Corpus Christi, Tex.	48	36	10	2	-	1	1	
Philadelphia, Pa.	686	490	114	49	17	16	45		Dallas, Tex.	181	107	35	26	11	2	3	
Pittsburgh, Pa.	80	52	25	1	1	1	4		El Paso, Tex.	81	53	13	10	3	2	4	
Reading, Pa.	29	21	8	-	-	-	6		Fort Worth, Tex.	78	55	14	4	4	1	3	
Rochester, N.Y.	114	80	27	4	1	2	9		Houston, Tex.	734	436	189	89	24	16	18	
Schenectady, N.Y.	23	14	6	1	1	1	2		Little Rock, Ark.	90	65	14	7	1	3	8	
Scranton, Pa.	22	15	6	1	-	-	1		New Orleans, La.	174	118	31	15	4	6	-	
Syracuse, N.Y.	106	78	18	7	1	4	4		San Antonio, Tex.	180	117	38	14	6	7	16	
Trenton, N.J.	42	27	6	9	-	-	5		Shreveport, La.	36	26	6	3	1	-	6	
Utica, N.Y.	22	18	4	-	-	-	1		Tulsa, Okla.	87	58	23	4	2	-	8	
Yonkers, N.Y.	36	29	6	-	-	1	2		MOUNTAIN	689	456	135	58	27	13	44	
E.N. CENTRAL	2,295	1,503	469	169	44	83	107		Albuquerque, N. Mex.	93	54	23	10	5	1	5	
Akron, Ohio	96	78	13	2	2	3	-		Colo. Springs, Colo.	48	28	10	4	6	-	7	
Canton, Ohio	31	26	4	1	-	-	3		Denver, Colo.	119	82	27	7	-	3	5	
Chicago, Ill.	564	362	125	45	10	22	16		Las Vegas, Nev.	98	57	20	16	4	1	6	
Cincinnati, Ohio	118	77	28	6	3	4	19		Ogden, Utah	27	19	4	3	1	-	4	
Cleveland, Ohio	157	93	45	17	6	6	7		Phoenix, Ariz.	144	101	23	7	7	6	5	
Columbus, Ohio	116	68	28	12	2	5	1		Pueblo, Colo.	18	12	3	2	1	-	3	
Dayton, Ohio	83	56	20	2	4	1	8		Salt Lake City, Utah	37	30	6	-	1	-	3	
Detroit, Mich.	235	142	48	35	2	8	12		Tucson, Ariz.	105	73	19	9	2	2	6	
Evansville, Ind.	63	48	10	4	-	1	3		PACIFIC	2,044	1,333	374	202	66	57	148	
Fort Wayne, Ind.	62	41	15	4	-	2	1		Berkeley, Calif.	26	20	4	2	-	-	2	
Gary, Ind.	13	9	2	2	-	-	5		Fresno, Calif.	87	56	20	8	-	3	6	
Grand Rapids, Mich.	50	34	9	3	1	-	2		Glendale, Calif.	25	19	4	1	1	-	1	
Indianapolis, Ind.	157	99	33	11	6	8	2		Honolulu, Hawaii	79	54	9	7	6	3	13	
Madison, Wis.	41	31	5	1	2	2	4		Long Beach, Calif.	112	77	17	11	4	3	20	
Milwaukee, Wis.	139	106	25	4	-	4	5		Los Angeles, Calif.	532	318	111	66	21	7	23	
Peoria, Ill.	46	33	9	-	2	2	4		Oakland, Calif.	90	59	18	9	2	2	5	
Rockford, Ill.	53	33	14	4	1	1	4		Pasadena, Calif.	34	21	6	2	2	3	3	
South Bend, Ind.	57	41	4	9	-	3	2		Portland, Ore.	133	95	20	4	6	7	9	
Toledo, Ohio	122	84	22	6	4	6	13		Sacramento, Calif.	158	106	28	14	3	7	15	
Youngstown, Ohio	54	42	10	1	-	1	1		San Diego, Calif.	173	108	32	14	8	10	19	
W.N. CENTRAL	709	517	105	46	15	26	36		San Francisco, Calif.	202	128	36	29	2	5	13	
Des Moines, Iowa	64	48	9	5	2	-	6		San Jose, Calif.	162	110	27	16	4	5	6	
Duluth, Minn.	28	19	7	2	-	-	-		Seattle, Wash.	143	101	18	17	6	1	3	
Kansas City, Kans.	120	20	4	4	1	3	2		Spokane, Wash.	50	33	15	-	1	1	5	
Kansas City, Mo.	322	84	22	8	2	6	8		Tacoma, Wash.	37	28	7	2	-	-	5	
Lincoln, Neb.	32	26	4	1	-	-	2		TOTAL	13,411 ^{††}	8,855	2,578	1,188	371	406	736	
Minneapolis, Minn.	179	123	29	12	7	8	10										
Omaha, Neb.	81	60	11	6	1	3	7										
St. Louis, Mo.	103	82	9	7	-	5	-										
St. Paul, Minn.	52	43	6	1	1	1	1										
Wichita, Kans.	16	12	4	-	-	-	-										

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

††Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

†††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past available 4 weeks.

M. tuberculosis — Continued

Editorial Note: Matching of AIDS and TB case registries in 43 states and 11 localities indicates that 4% of AIDS patients also have had TB; this is more than 400 times the 1986 national incidence of 9.4 cases per 100,000 population. TB has occurred in persons in all major transmission categories of human immunodeficiency virus (HIV) (2).

Health-care workers and patients may be at risk for exposure to TB in settings where cough-inducing procedures, such as aerosolized administration of medications, sputum induction, and bronchoscopy, are performed on patients with TB. TB should be considered in the differential diagnosis of patients with unexplained pulmonary signs and/or symptoms, and especially in patients with HIV infection, because such patients are at high risk for TB (2). This investigation raises the question of whether aerosolized pentamidine administered to patients with pulmonary TB can play a role in TB transmission; however, in this investigation, transmission caused by exposure to TB patients not receiving aerosolized pentamidine could not be ruled out. During cough-inducing procedures, including aerosolized pentamidine treatments, recommendations for preventing transmission of tuberculous infection to health-care workers should be followed (3-5).

Aerosolized pentamidine is widely used for the treatment and prophylaxis of PCP in AIDS patients (6-8). Before beginning aerosolized pentamidine therapy, patients should be evaluated for the presence of potentially infectious TB with a chest radiograph and sputum smears for AFB. If the chest radiograph is not suggestive of active TB and two to three sputum smears are negative for AFB, aerosolized pentamidine treatments can be initiated. Any patient suspected of having potentially infectious TB should be started on anti-TB therapy before starting aerosolized pentamidine treatment. If the clinical situation allows, it is preferable to observe a reduction in the number of AFB on smear before starting the aerosolized pentamidine. All cough-inducing procedures should be carried out in rooms or booths with negative air pressure in relation to adjacent rooms or hallways. Air in these rooms or booths should be exhausted directly to the outside of the building and away from intake vents (5).

If possible, after completion of such procedures, patients who are coughing should be dismissed from the clinic and should not remain in common waiting areas. Although western Palm Beach County has a high prevalence of both tuberculous and HIV infections (9-11), clinics in other areas also treat substantial numbers of patients at risk for both infections (12-16). Therefore, health workers who take care of patients with undiagnosed pulmonary disease should be alerted to the potential for infectious TB and take appropriate measures to protect themselves, other staff, and patients from the transmission of tuberculous infection.

References

1. Shaw JB, Wynn-Williams N. Infectivity of pulmonary tuberculosis in relation to sputum status. *Am Rev Respir Dis* 1954;69:724-32.
2. Pitchenik AE, Fertel D, Bloch AB. Mycobacterial disease: epidemiology, diagnosis, treatment, and prevention. *Clin Chest Med* 1988;9:425-41.
3. Garner JS, Simmons BP. Guideline for isolation precautions in hospitals. *Infect Control* 1983;4(suppl):245-325.
4. CDC. Guidelines for prevention of TB transmission in hospitals. Atlanta: US Department of Health and Human Services, Public Health Service, 1982; HHS publication no. (CDC)82-8371.
5. CDC. Tuberculosis and human immunodeficiency virus infection: recommendations of the Advisory Committee for the Elimination of Tuberculosis. *MMWR* 1989;38:236-8,243-50.
6. Montgomery AB, Debs RJ, Luce JM, et al. Aerosolized pentamidine as sole therapy for

M. tuberculosis — Continued

- Pneumocystis carinii* pneumonia in patients with acquired immunodeficiency syndrome. Lancet 1987;2:480-3.
7. Conte JE Jr, Hollander H, Golden JA. Inhaled or reduced-dose intravenous pentamidine for *Pneumocystis carinii* pneumonia. Ann Intern Med 1987;107:495-8.
 8. Armstrong D, Bernard E. Aerosol pentamidine. Ann Intern Med 1988;109:852-4.
 9. Pitchenik AE, Russell BW, Cleary T, et al. The prevalence of tuberculosis and drug resistance among Haitians. N Engl J Med 1982;307:162-5.
 10. Castro KG, Lieb S, Jaffe HW, et al. Transmission of HIV in Belle Glade, Florida: lessons for other communities in the United States. Science 1988;239:193-7.
 11. Pitchenik AE, Cole C, Russell BW, et al. Tuberculosis, atypical mycobacteriosis, and the acquired immunodeficiency syndrome among Haitian and non-Haitian patients in south Florida. Ann Intern Med 1984;101:641-5.
 12. CDC. Tuberculosis and acquired immunodeficiency syndrome—Florida. MMWR 1986;35:587-90.
 13. CDC. Tuberculosis and acquired immunodeficiency syndrome—New York City. MMWR 1987;36:785-90,795.
 14. CDC. Tuberculosis and AIDS—Connecticut. MMWR 1987;36:133-5.
 15. Sunderam G, McDonald RJ, Maniatis T, et al. Tuberculosis as a manifestation of the acquired immunodeficiency syndrome (AIDS). JAMA 1986;256:362-6.
 16. Chaisson RE, Schechter GF, Theur CP, et al. Tuberculosis in patients with the acquired immunodeficiency syndrome: clinical features, response to therapy, and survival. Am Rev Respir Dis 1987;136:570-4.

Current Trends

Economic Burden of Spina Bifida — United States, 1980-1990

Spina bifida is one of the most common and disabling birth defects and results in varying degrees of paralysis from permanent damage to the spinal cord and spinal nerves. Based on rates from CDC's Birth Defects Monitoring Program (1), from 1980 through 1987, an estimated 13,600 infants born in the United States had spina bifida without anencephaly. Of these, approximately 3800 have died as a result of their defects. Although the estimated rate of infants born with spina bifida has decreased from 1980 (5.2/10,000 live births) through 1987 (4.3/10,000 live births), a substantial number of infants survive into childhood each year; an estimated 9800 children born with spina bifida between 1980 and 1987 were alive in 1987. Even if the rate of infants born with spina bifida continues to decline at the same rate from 1988 through 1990, the number of surviving children born with spina bifida since 1980 will be approximately 13,000 by the end of 1990 (Figure 1).

Spina bifida-associated damage to the spinal cord produces severe disabilities requiring extensive medical and surgical care. In the United States, infants with spina bifida routinely receive vigorous medical therapy and undergo repeated surgical procedures to survive and to reach their maximum functional capacity. At birth, the spinal defect is closed surgically. Because the severe spinal nerve damage impairs lower extremity motor functions, many children are confined to wheelchairs, although others can walk with the assistance of braces. Almost all require multiple orthopedic surgical operations. Bladder and sphincter control are also affected, causing chronic urinary tract infections. Hydrocephalus is usually associated with spina bifida and requires insertion of a shunt to relieve intracranial pressure and to prevent brain damage. These shunts often require multiple revisions and replacement during childhood. Throughout childhood, adolescence, and adulthood, the

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management of the Arnold-Chiari malformation (a malformation of the cerebellum and medulla oblongata) associated with spina bifida and of urologic problems often requires more surgical procedures.

National estimates of the total cost to society for medical care, education, and lost productivity are difficult to calculate for several reasons. The current prevalence of spina bifida in older cohorts is unknown. Also, data on the educational and employment patterns of persons with spina bifida are unavailable, as are valid national data on costs of medical and surgical treatment and other therapies. CDC has estimated the direct medical costs by using average annual age-specific charges* for medical and surgical procedures for open spina bifida from North Carolina (2). These cost estimates were applied to the estimated cohorts of surviving children born since 1980 to arrive at the projected annual costs (in 1985 dollars, not discounted) from 1980 through 1990 (Figure 2). If the costs for all children born with spina bifida from 1980 through 1990 are discounted by 5%, the resulting present value (using 1985 as the base year) exceeds \$775 million.

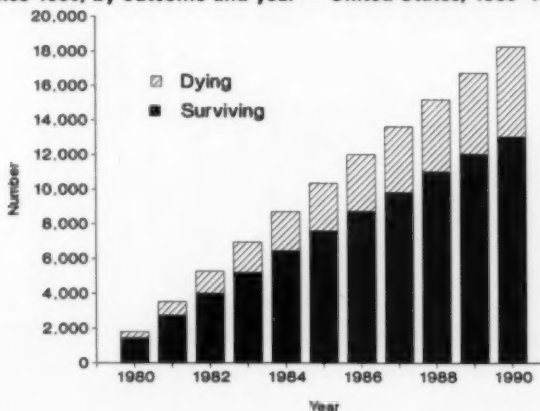
Reported by: Birth Defects and Genetic Diseases Br and Developmental Disabilities Br, Div of Birth Defects and Developmental Disabilities, Center for Environmental Health and Injury Control, CDC.

Editorial Note: Spina bifida is a major contributor to morbidity and mortality in childhood. The rate of spina bifida in the United States has been declining and now is among the lowest in the world. Nevertheless, each year approximately 1500 infants are born in the United States with spina bifida; more than 1000 of these survive into childhood (Figure 1). The highest estimated U.S. rates of spina bifida—about 10/10,000 live births—are in Appalachia (3).

Annual medical and surgical care costs in the United States for all persons with spina bifida probably exceed \$200 million. In 1990, the average annual cost for

*While charges are generally not the best measure of the incremental, or marginal, resource cost of medical care, they are the appropriate means of measuring the financial burden of care on parents, private insurers, and government.

FIGURE 1. Estimated cumulative number of surviving and dying infants with spina bifida born since 1980, by outcome and year — United States, 1980–1990



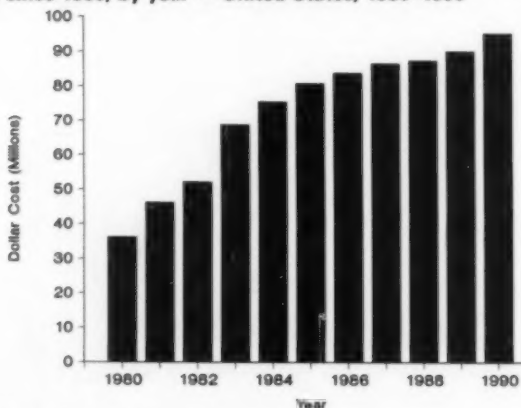
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medical and surgical care for all surviving children born since 1980 will approach \$100 million (Figure 2). However, this estimate excludes costs generated since 1980 for all persons born with spina bifida before 1980. These cohorts are as large as those born after 1980; therefore, it is likely that their costs would equal or exceed those of the post-1980 cohorts. For a person with typical severe spina bifida, estimated lifetime costs—including direct costs such as medical and surgical care, long-term care, disability, and education, and indirect costs such as survivor productivity effects and loss of parental income—are \$250,000 (in 1985 dollars discounted by 5%) (2).

The descriptive epidemiology of spina bifida and anencephaly has suggested hypotheses regarding environmental (nongenetic) factors as important contributors to causing most of these defects. In the last 50 years, epidemics of spina bifida have occurred in Boston; Rochester, New York; Dublin, Ireland; and northern People's Republic of China (4,5). Rates of spina bifida vary widely among countries and by geographical regions within countries. The current highest reported rate is 37/10,000 births in rural northern People's Republic of China (5), about nine times the total U.S. rate of 4.3/10,000 live births in 1987. Low socioeconomic status has been strongly associated with risk for these defects in many populations. The causes of spina bifida must be identified to design effective primary prevention. These epidemiologic findings suggest that such identification may be possible.

Nutritional status has been widely studied as a risk factor for spina bifida in the last decade. In particular, periconceptional vitamin supplementation in women who previously had had an affected infant was studied in a nonrandomized clinical trial and reported in 1981 to be protective (6). However, 95% of all infants with spina bifida are born to women who have never had an affected infant. A CDC case-control study of a large group of these women showed that those who reported using multivitamin supplementation during the periconceptional period had a 50% reduction in the incidence of spina bifida in their children (7,8). It cannot yet be determined whether the apparent protective effect associated with multivitamins results directly from

FIGURE 2. Estimated annual costs* for medical and surgical care of all spina bifida patients born since 1980, by year — United States, 1980–1990



*Estimates in (real) 1985 dollars, not discounted.

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multivitamin use or from other characteristics of women who use vitamins. Therefore, the evidence accumulated to date does not support recommendation of a national policy for treating all women at risk for pregnancy with multivitamins. Well-designed randomized clinical trials would be a means by which to examine this issue further.

References

1. CDC. Congenital malformations surveillance report: January 1982–December 1985. Atlanta: US Department of Health and Human Services, Public Health Service, 1986.
2. Lipscomb J. Human capital, willingness-to-pay and cost-effectiveness analyses of screening for birth defects in North Carolina [Working paper]. Durham, North Carolina: Duke University, Institute of Policy Sciences and Public Affairs, 1986.
3. Greenberg F, James LM, Oakley GP Jr. Estimates of birth prevalence rates of spina bifida in the United States from computer-generated maps. *Am J Obstet Gynecol* 1983;145:570–3.
4. Elwood JM, Elwood JH. Epidemiology of anencephalus and spina bifida. Oxford: Oxford University Press, 1980.
5. Lian ZH, Yang HY, Li Z. Neural tube defects in Beijing-Tianjin area of China: urban rural distribution and some other epidemiological characteristics. *J Epidemiol Community Health* 1987;41:259–62.
6. Smithells RW, Nevin NC, Seller MJ, et al. Further experience of vitamin supplementation for prevention of neural tube defect recurrences. *Lancet* 1983;1:1027–31.
7. Mulinare J, Cordero JF, Erickson JD, Berry RJ. Periconceptional use of multivitamins and the occurrence of neural tube defects. *JAMA* 1988;260:3141–5.
8. CDC. Periconceptional use of multivitamins and the occurrence of anencephaly and spina bifida. *MMWR* 1988;37:727–30.

*Epidemiologic Notes and Reports***Listeriosis Associated with Consumption of Turkey Franks**

Microbiologic implication of meat as a source of clinical listeriosis has not previously been documented. In December 1988, a woman with cancer was hospitalized in Oklahoma with sepsis caused by *Listeria monocytogenes* (LM). LM was isolated from an open package of Plantation Brand turkey franks from the patient's refrigerator. The patient had eaten one turkey frank daily heated in a microwave oven. LM was also isolated from two unopened packages of Plantation Brand turkey franks from a local store. Cultures of other foods in the patient's refrigerator were positive for LM; however, unopened samples of those foods were negative for LM.

LM isolates from the patient and from the opened and unopened packages of franks were confirmed at CDC as serotype 1/2a with the same electrophoretic enzyme type. On April 14, 1989, the company voluntarily recalled the franks, and the U.S. Department of Agriculture began an investigation of the processing plant.

Multiple products from the patient's refrigerator grew LM of the same serotype and enzyme type, suggesting cross-contamination; therefore, isolation of LM from opened packages is not sufficient to identify the source of infection. Isolation from unopened products implicates the source of infection with greater certainty.

An epidemiologic study of dietary risk factors for sporadic cases of listeriosis previously implicated consumption of uncooked hot dogs and undercooked chicken (1); in that study, no microbiologic specimens were obtained.

LM causes 1700 cases of meningitis and sepsis in the United States each year, with a case-fatality rate of 25%. Listeriosis usually occurs in pregnant women or immuno-

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suppressed persons. Such persons who have eaten this brand of turkey franks and are not ill do not need treatment. Persons who have eaten this food and develop fever, severe headache, or muscle aches should consult their physicians.

Reported by: R Barnes, P Archer, MPH, J Strack, GR Istre, MD, State Epidemiologist, Oklahoma State Dept of Health. Meningitis and Special Pathogens Br, Div of Bacterial Diseases, Center for Infectious Diseases, CDC.

Reference

1. Schwartz B, Cielinski C, Broome CV, et al. Dietary risk factors for sporadic listeriosis: association with consumption of uncooked hot dogs and undercooked chicken. *Lancet* 1988;2:779-82.

Errata: Vol. 38, No. 14

In the article "Tuberculosis and Human Immunodeficiency Virus Infection: Recommendations of the Advisory Committee for the Elimination of Tuberculosis (ACET)," two errors regarding the size of tuberculin skin reactions occurred: 1) on page 243, the second to last line of the second full paragraph should end "*tuberculin reactions of ≥ 5 -mm induration*"; and 2) on page 248, the fifth line from the top of the page should begin " *≥ 10 -mm induration*."

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The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333; telephone (404) 332-4555.

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